Model Train Lighting

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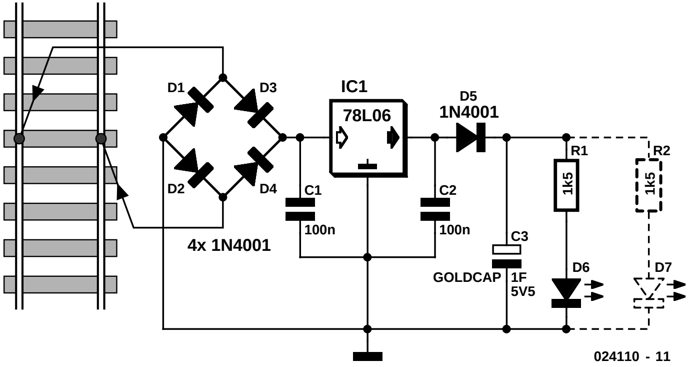
One thing that's still always very irritating with model train setups is that the locomotive or carriage lights often flicker with the train passes over a turnout or a bad section of track. This simple circuit can put an end to this. Even better, it ensures that the lights burn at a constant brightness (within certain limits), regardless of the speed of travel (which means the voltage on the rails), and the lights remain on when the locomotive is stationary for a while.

With ac systems, bridge rectifier B1 ensures that the ac voltage is converted into a dc voltage. This rectifier is also necessary with dc systems, since the polarity constantly changes according to the direction of travel. The voltage, now with a fixed polarity, is then stabilised at 6 V by voltage regulator IC1. Two small capacitors (100 nF) are added to ensure stability; they should be fitted as close as possible to the regulator. Next comes a diode (D5) that prevents energy from being lost through the voltage regulator when there is no voltage on the rails. This is followed by the central element of the circuit: a megacapacitor (C3) that acts as a 'storage reservoir' for the energy. This 'Goldcap' is available in values of 0.1 F to 22 F (yes that's farads, not microfarads!). Since C3 can be charged by the 78L06 at a maximum current of 100 mA, it will take slightly less than a minute for a 1-F type to become fully charged.

The lights are powered from the Goldcap. It's best to use low-power, high-efficiency LEDs, each with its own series resistor. A current of 2 mA per LED is sufficient, so a value of around 1.5 kΩ can be used for the series resistors. The length



of time that the lights remain illuminated depends on the total current consumption and the size of the Goldcap. If you have enough space, don't skimp, and instead select one with a bit more capacitance.

You can experiment with the circuit to your heart's content, but note that the Goldcap cannot tolerate voltages greater than 5.5 V. With a 6-V regulator followed by a voltage drop of 0.6V across the diode, we have 5.4 V.

To calculate how long the LEDs will remain illuminated, you can use the formula time = (capacity) × (voltage change) ÷ (current). For example, suppose there are five LEDs drawing 2 mA each. When the Goldcap is fully charged, the voltage across it is 5.4 V. Once it has been discharged to 2.5 V, the LEDs will scarcely generate any more light. The voltage change is thus 3 V. The length of time that the lights remain on is therefore (1 F) × (3 V) ÷ (0.01 A) = 300 s, or 5 minutes. With a 0.1-F capacitor the duration is half a minute, but with al value of 22 F the duration is 110 minutes, or nearly two hours!

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